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Claims

1. Imaging optics (1) with main optics (9) comprising a plurality of optical elements (2, 3, 4, 5, 6, 7), said main optics being corrected for an observation radiation, and said imaging optics further comprising a transmissive, diffractive element (10), which is arranged in the observation
10 beam path of the imaging optics (1) and is provided such that, due to the diffractive effect of the diffractive element (10), at least one aberration of the main optics is corrected for an inspection radiation having a different wavelength than that of the observation radiation.
2. The imaging optics as claimed in Claim 1, wherein the diffractive element (10)
15 essentially does not change the imaging properties of the main optics (9) for the observation radiation.
3. The imaging optics as claimed in Claim 1 or 2, wherein the diffracted inspection radiation of a predetermined, non-zeroth order of diffraction is used for correction of said aberration.
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4. The imaging optics as claimed in any one of the above Claims, wherein the diffraction efficiency of the diffractive element (10) for the zeroth order of diffraction of the observation radiation is greater than the sum of the diffraction efficiencies of all other orders of diffraction of the observation radiation.
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5. The imaging optics as claimed in any one of the above Claims, wherein the diffraction efficiency of the diffractive element (10) for the zeroth order of diffraction of the observation radiation is at least 80%.
- 30 6. The imaging optics as claimed in any one of the above Claims, wherein the diffractive element (10) is a phase grating.
7. The imaging optics as claimed in any one of the above Claims, wherein the diffractive element (10) is a grating having symmetry, preferably rotation-symmetry, about the optical axis
35 of the main optics.
8. The imaging optics as claimed in any one of the above Claims, wherein the diffractive element (10) comprises annular depressions which are concentric.

9. The imaging optics as claimed in Claim 8, wherein all depressions have the same depth.
10. The imaging optics as claimed in Claim 8, wherein the depth of the individual depressions
5 decreases as the radial distance from the optical axis (OA) of the main optics (9) increases.
11. The imaging optics as claimed in any one of the above Claims, wherein the diffractive
element (10) is provided on one side of a plane-parallel plate.
- 10 12. The imaging optics as claimed in any one of the above Claims, wherein the diffractive
element (10) is provided on an optically effective surface of a refractive optical element (2-4, 6-
8) of the main optics (9).
13. The imaging optics as claimed in Claim 11 or 12, wherein the diffractive element (10) is
15 provided only in an annular region on the side of the plane-parallel plate or on the optically
effective surface of the optical element (2-4, 6-8), respectively.
14. The imaging optics as claimed in any one of the above Claims, wherein the diffractive
element (10) is a blaze grating.
- 20 15. The imaging optics as claimed in any one of the above Claims, wherein the diffractive
element (10) has a blaze profile approximated in steps.
16. The imaging optics as claimed in any one of the above Claims, wherein the diffractive
25 element (10) is arranged in the region where the observation radiation has the greatest beam
diameter in the main optics (9).
17. The imaging optics as claimed in any one of the above Claims, wherein the main optics
(9) comprise a second diffractive element (5) which has a diffraction-enhancing and
30 achromatizing effect for the observation radiation.
18. The imaging optics as claimed in any one of the above Claims, wherein the diffraction
efficiency of the second diffractive element (5) for the zeroth order of diffraction of the
observation radiation is greater than the sum of the diffraction efficiencies of all other orders of
35 diffraction of the observation radiation.

19. The imaging optics as claimed in Claim 17 or 18, wherein the desired achromatization of the main optics for a wavelength region containing the wavelength of the observation radiation is caused completely by the second diffractive element (5).

5 20. The imaging optics as claimed in any one of Claims 17 to 19, wherein the second diffractive element comprises a transmission grating formed on one side of a plane-parallel plate or on an optically effective surface of a refractive optical element of the main optics.

10 21. The imaging optics as claimed in any one of Claims 17 to 19, wherein the first diffractive element (10) is provided on one side of a plane-parallel plate or of a refractive optical element of the main optics, and the second diffractive element is provided on the other side of the plane-parallel plate or of the refractive optical element, respectively.

15 22. The imaging optics as claimed in any one of the above Claims, wherein all optical elements (2-8) of the main optics (9) and the first diffractive element (10) are formed of a maximum of two different materials, preferably of the same material.

20 23. The imaging optics as claimed in any one of the above Claims, wherein all optical elements (2-8) of the main optics (9) and the first diffractive element (10) are mounted without cement.

25 24. A method for the manufacture of imaging optics, wherein a main optics (9) comprising a plurality of optical elements (2, 3, 4, 5, 6, 7, 8) is computationally assembled and corrected for a predetermined observation radiation; then a transmissive diffractive element (10) is computationally arranged in the observation beam path of the imaging optics (1) and optimized with regard to its phase function such that at least one aberration of the main optics (9) is corrected, by the diffractive effect of the diffractive element, for an inspection radiation having a different wavelength than that of the observation radiation and wherein, further, the optical data required for manufacturing the imaging optics thus computed are generated, and the imaging
30 optics are manufactured on the basis of the generated optical data.